

FIG. 1

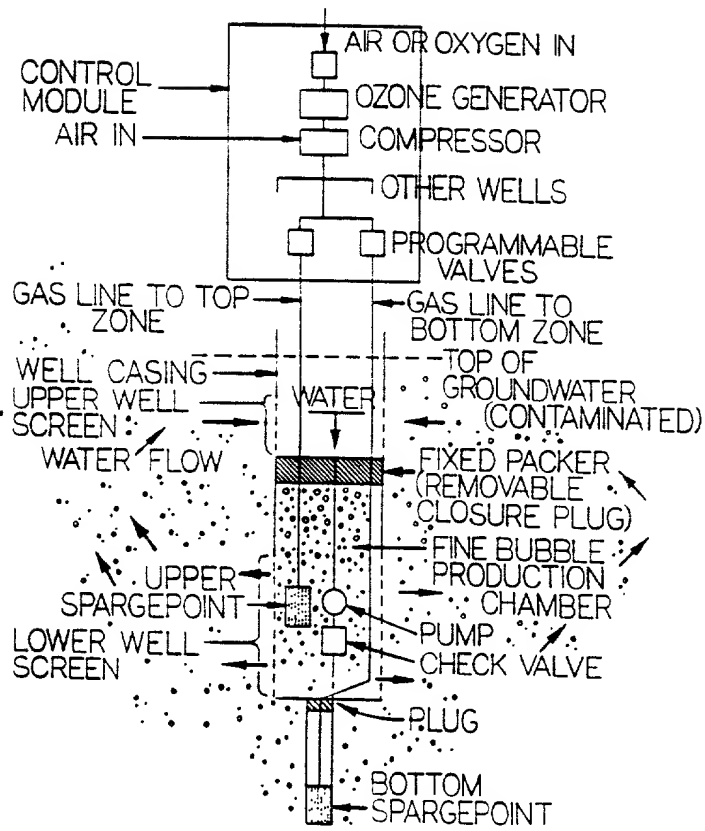


FIG. 2

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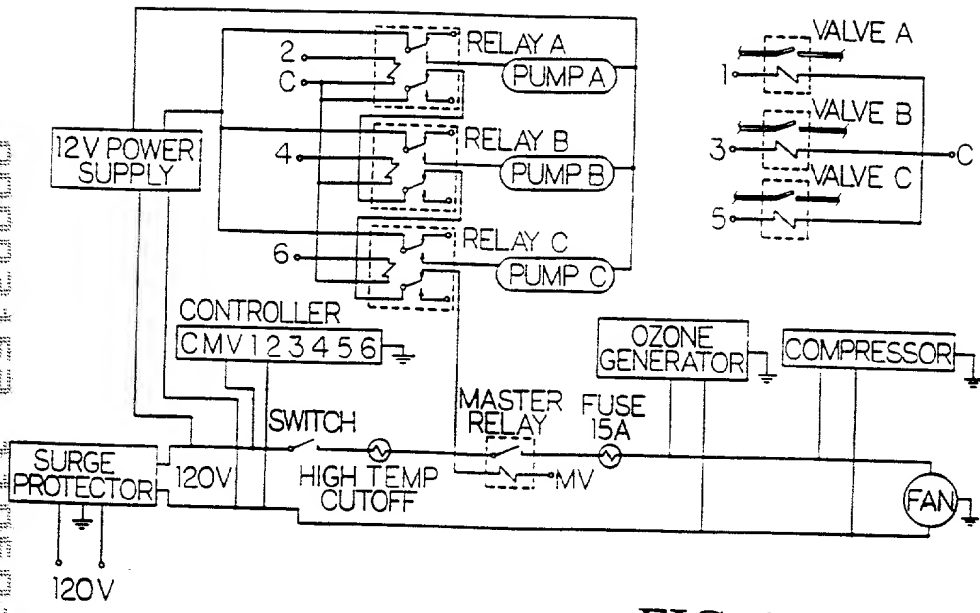


FIG. 3

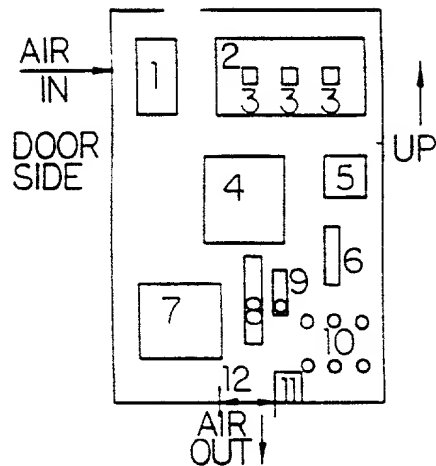


FIG. 4

- 1 AC TO DC POWER CONVERTER (OR TRICKLE CHARGED LEAD ACID BATTERY)
- 2 OZONE GENERATOR
- 3 WELL GAS RELAYS (3 WELLS SHOWN)
- 4 COMPRESSOR
- 5 MASTER RELAY
- 6 15A MAIN FUSE
- 7 PROGRAMMABLE TIMER - CONTROLLER
- 8-POWER STRIP
- 9 GAS REGULATOR AND PRESSURE GAGE
- 10 SOLENOID MANIFOLD (NUMBER DEPENDS ON SERIES AND NUMBER WELLS)
- 11 GROUND FAULT INTERRUPTOR
- 12 COOLING FAN

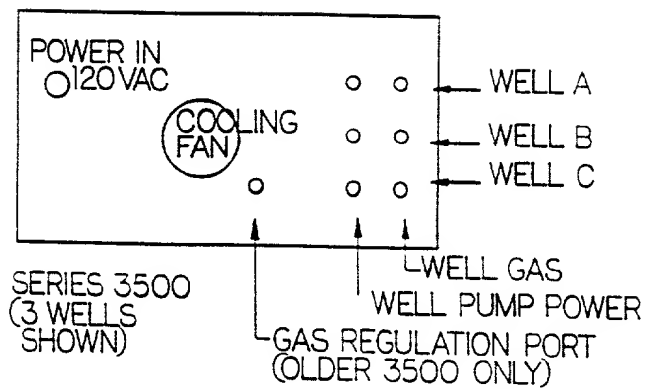


FIG. 5A

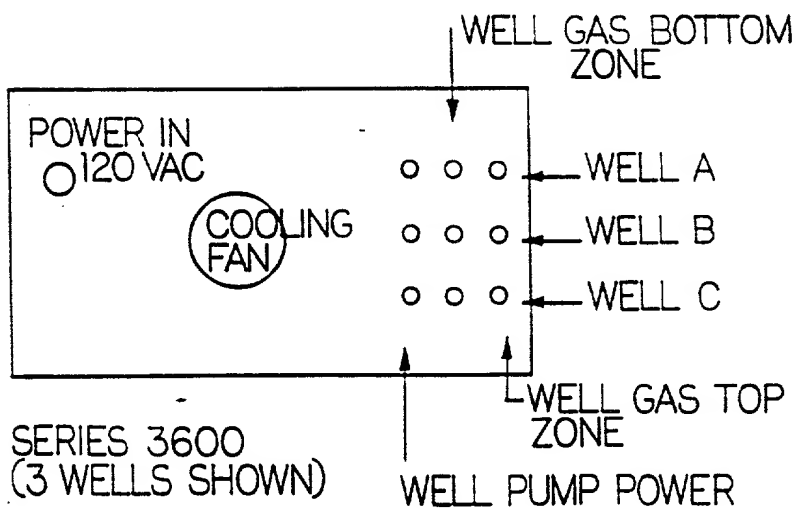


FIG. 5B

FIG. 6

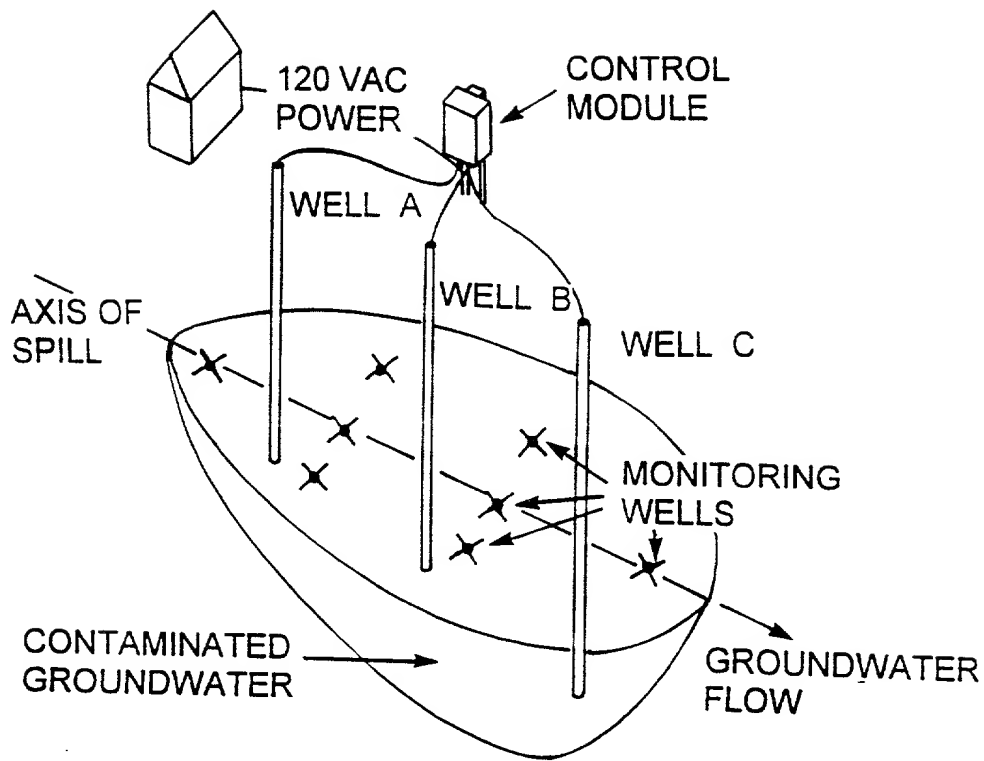


FIG. 6

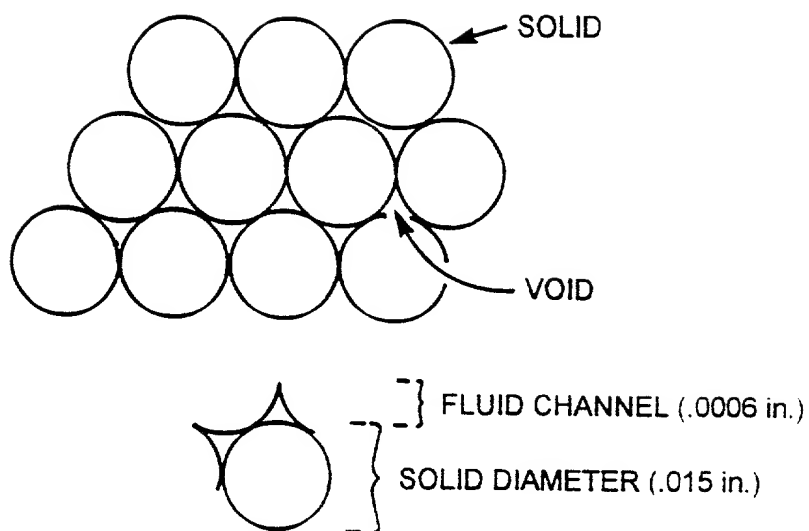
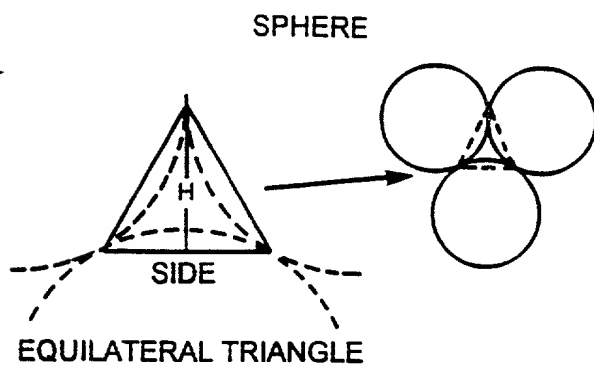
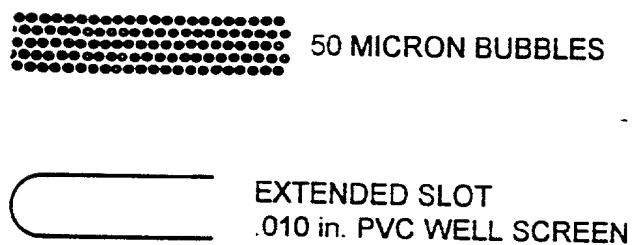
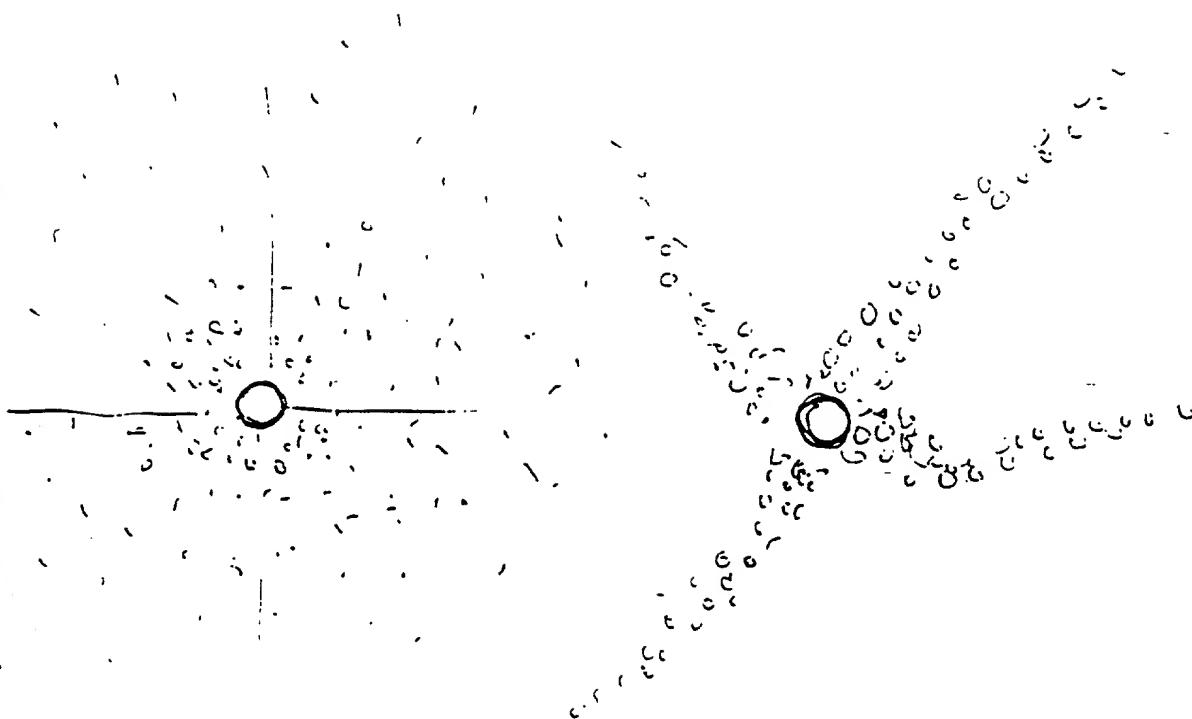


FIG. 7



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**MICROPOROUS  
DIFFUSER**

**STANDARD  
WELL SCREEN**

**FIG. 8**



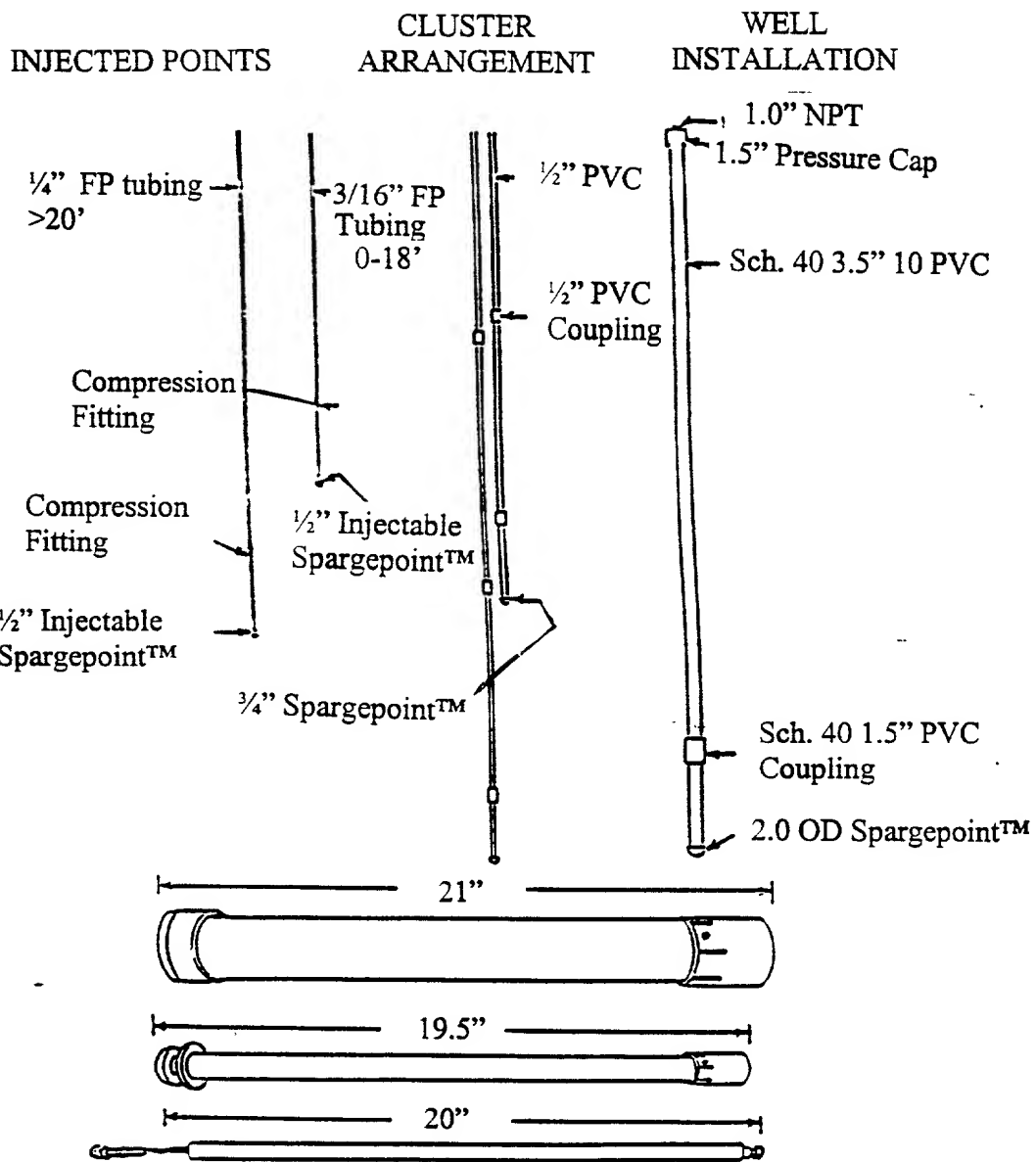
FIG. 9 - 25 FEB 68

Permeability of Glass Beads Compared  
with Permeability of Soil Fractions

Mean Bead Diameter (mm)	Pore Space (microns)	Permeability (Darcy)	Gas Conductivity (cm/sec)	Equivalent Soil Classification
2.000	860	1000	1.000	Very coarse sand
1.200	516	250	0.250	Coarse sand
0.655	281	147	0.147	Medium coarse sand
0.327	140	85	0.085	Medium sand
0.167	72	22	0.022	Fine-medium sand
0.083	36	9	0.009	Fine sand
0.041	18	5	0.005	Very fine sand
0.020	9	2	0.002	Very fine silty sand

Modified from Anderson, et.al., 1987<sup>2</sup>

FIG. 9



**FIG. 10**

```

graph TD
    A[SOIL BORINGS] --> B[EXTEND OF CONTAMINATION  
HYDRAULIC CONDUCTIVITY]
    B --> C[SPACING - MONITORING WELLS  
AND/OR PIEZOMETERS]
    C --> D[FIELD PROCEDURES]
    D --> E[MONITORING DURING TEST]
    E --> F[1. YIELD/PRESSURE CURVE  
2. HEAD RISE  
3. BUBBLE DISTRIBUTION/  
DENSITY  
4. BUBBLE COLLECTION/GAS  
CONCENTRATION]
    F --> G[INTERPRETATION OF RESULTS]
    G --> H[SYSTEM DESIGN]
  
```

FIG. 11

SPARGEPOINT™ TEST ASSEMBLY  
1/2" OR 3/4" POINT WITH 1 INCH CASING

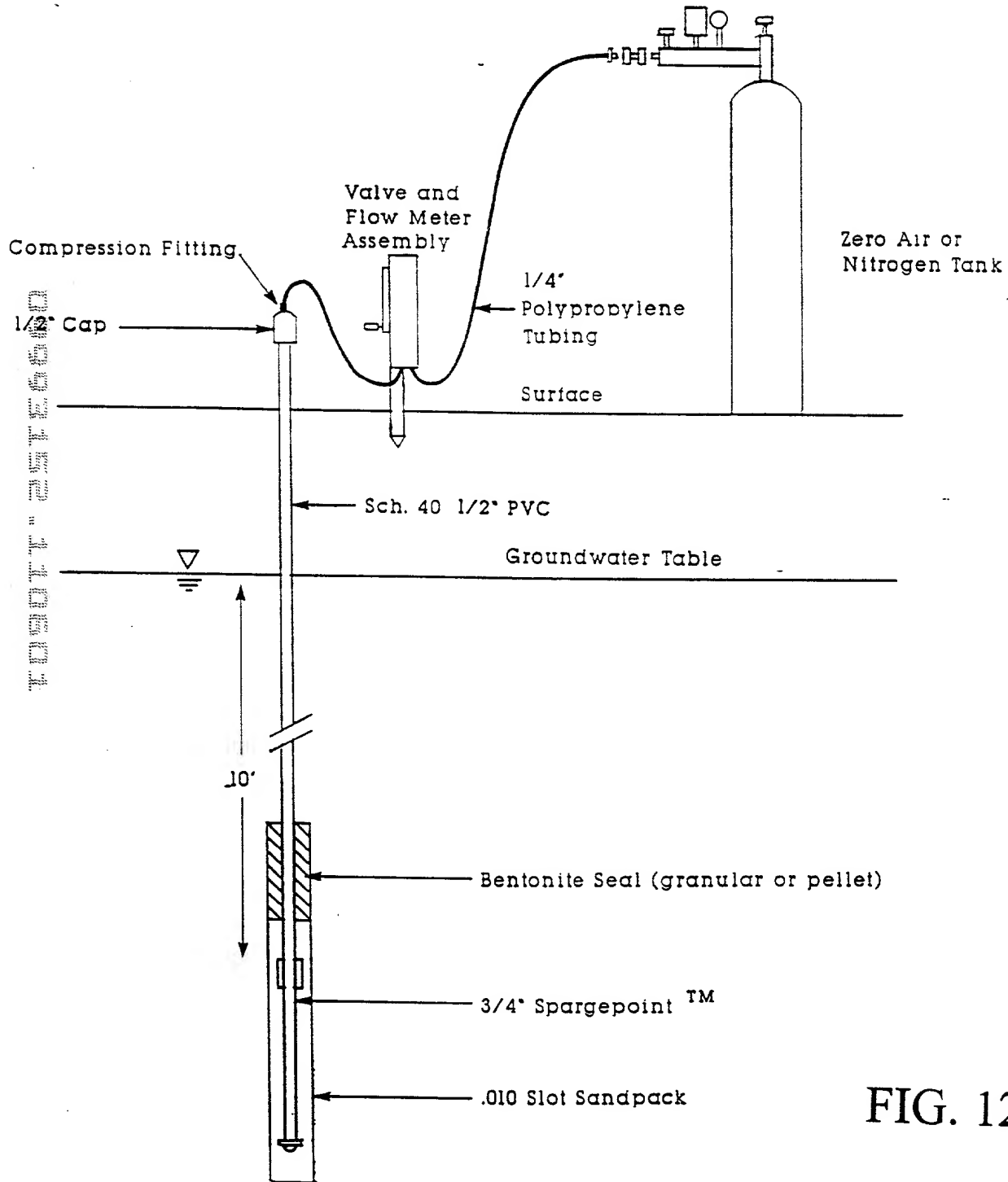


FIG. 12

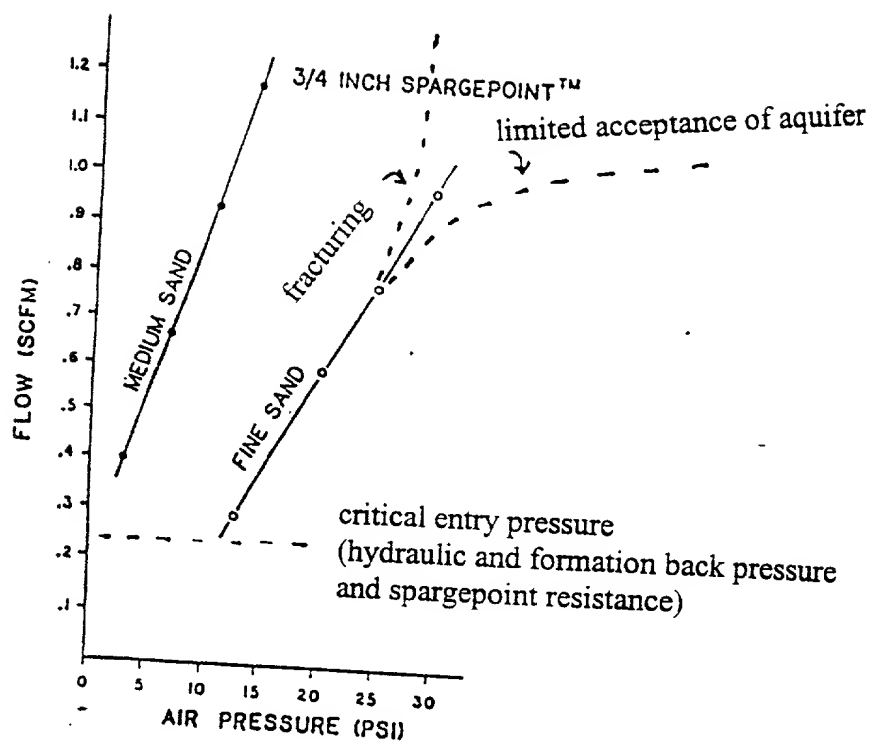


FIG. 13

# INFLUENCE OF DEPTH AND PRESSURE ON RADIUS OF BUBBLE ZONE

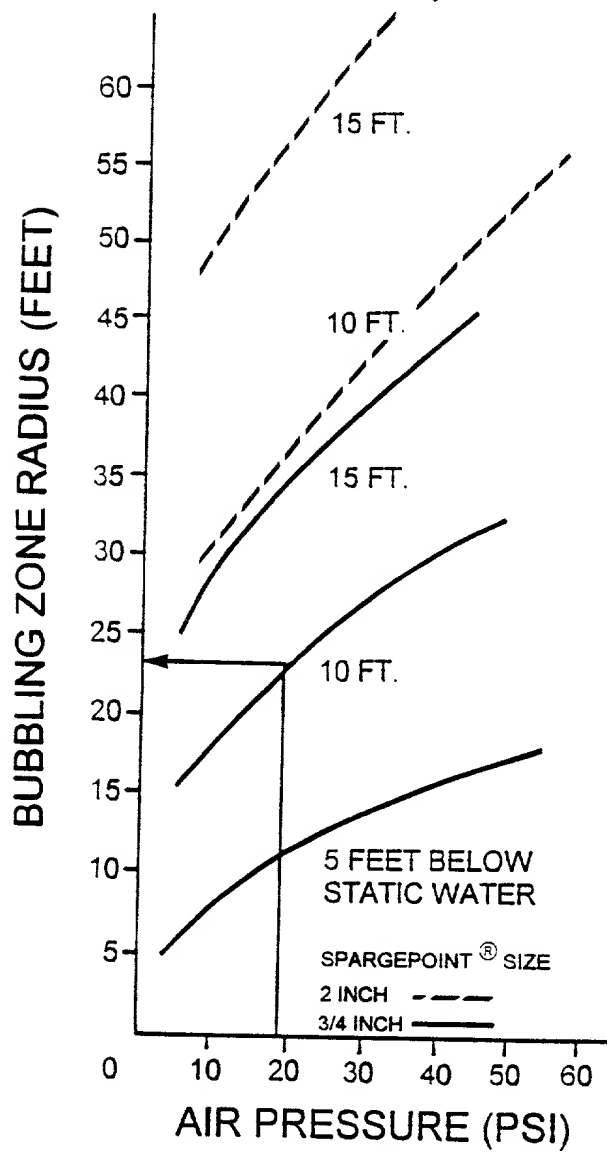


FIG. 14

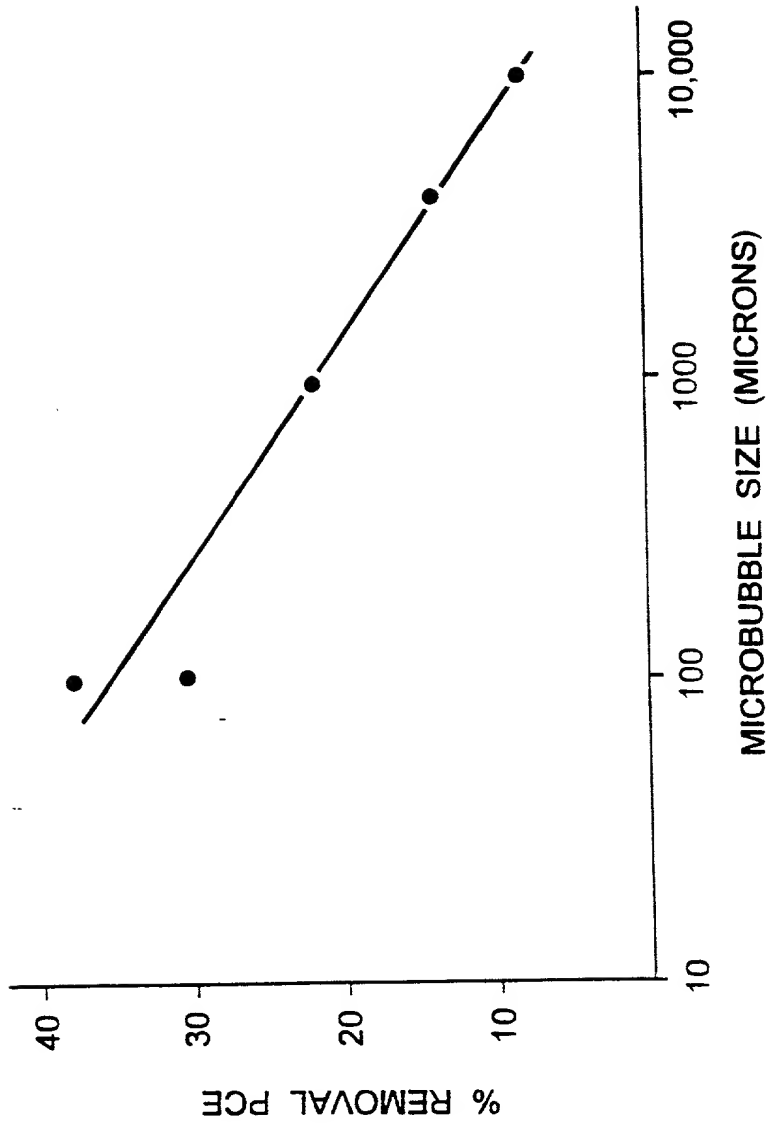


FIG. 15

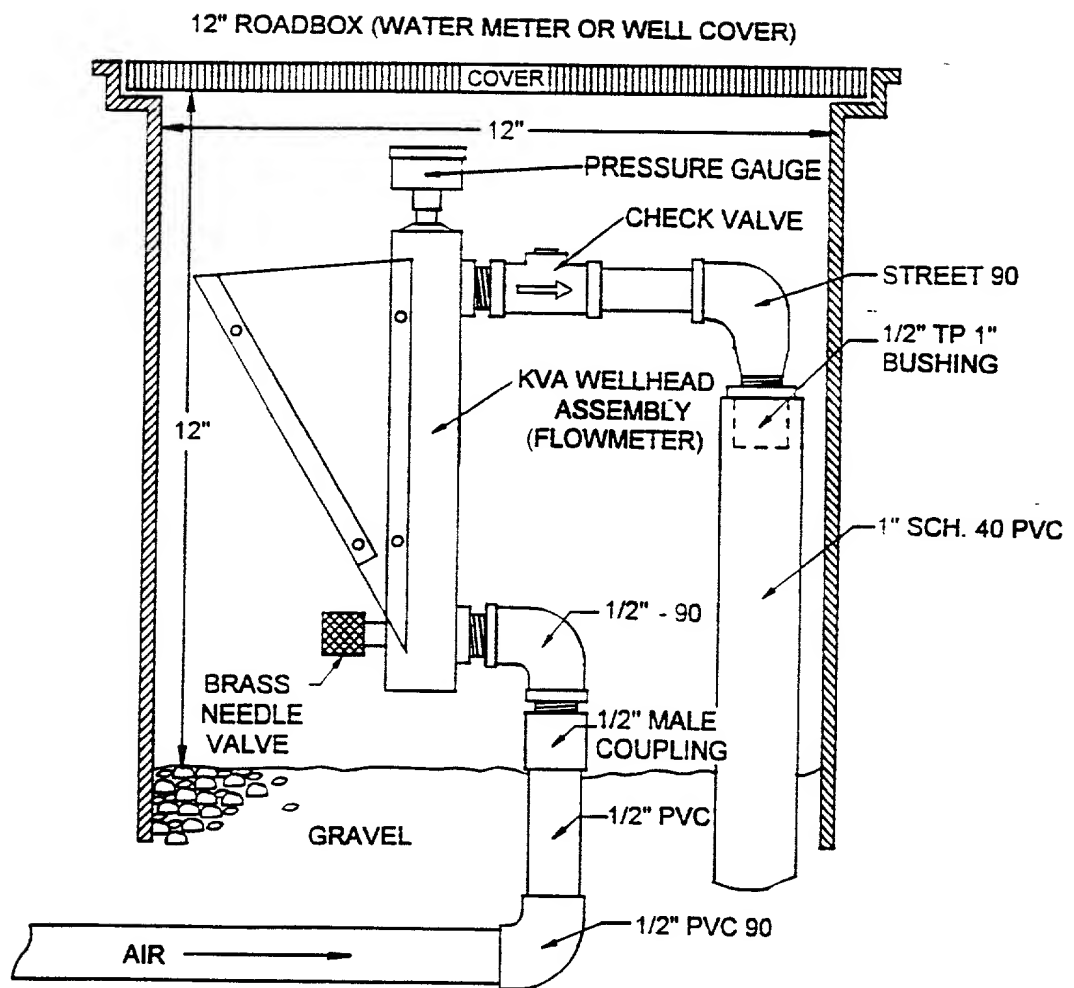
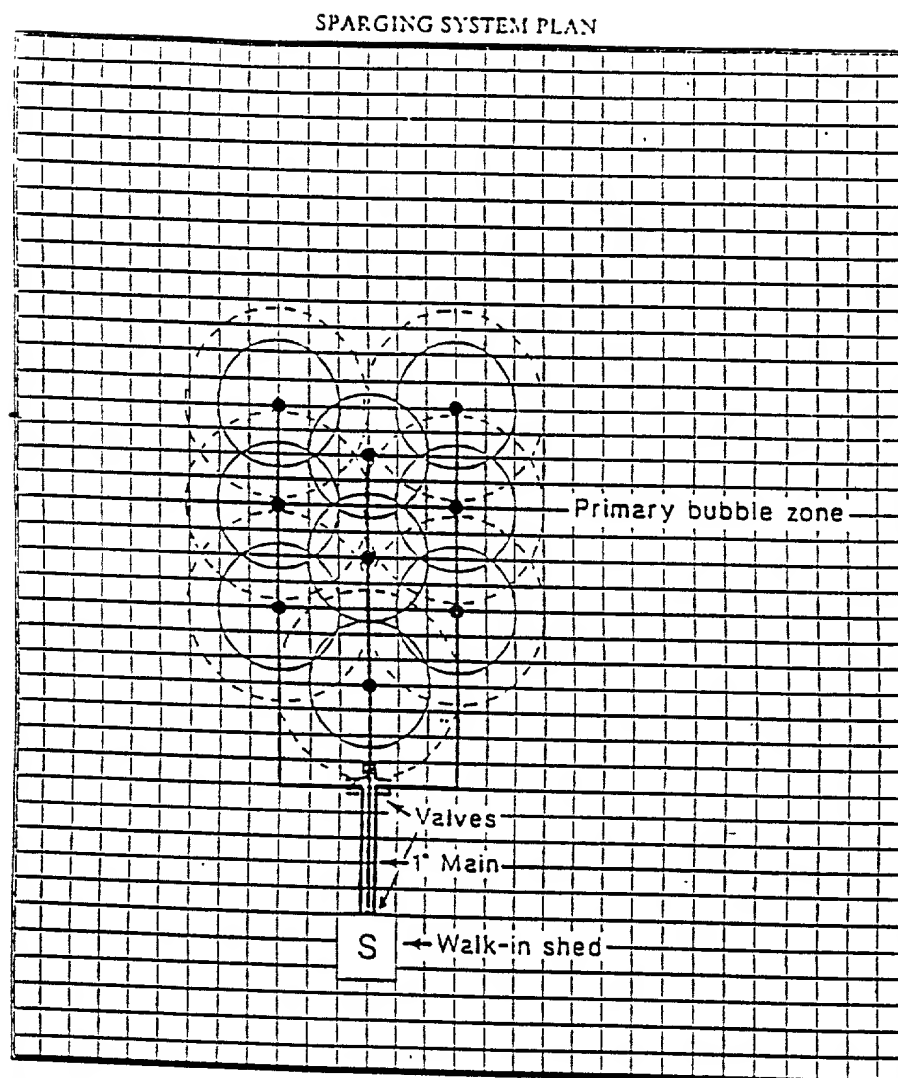


FIG. 16



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Size of Sparge Area	100 x 150 ft	Size of SVE Area	150 x 200 ft
Use of Zone Control?	3 zones	Size of SVE System	150 scfm
Number of Spargepoints™	9	Depth to Water	10 ft
Soil Conditions	MEDIUM SAND	Type of Contaminant	BTEX

**FIG. 17**

←TUBING

SPARGED AREA

MOUNDED WATER

SPARGE POINT

The diagram illustrates a cross-section of a tank. A vertical line at the top is labeled '←TUBING'. At the bottom of this line is a small circle labeled 'SPARGE POINT'. From this point, a large, teardrop-shaped region expands upwards, filled with a stippled pattern. This region is labeled 'SPARGED AREA'. Within this stippled region, there is a smaller, horizontally-oriented oval area filled with horizontal lines, labeled 'MOUNDED WATER'.

FIG. 18

FOOT 251E660

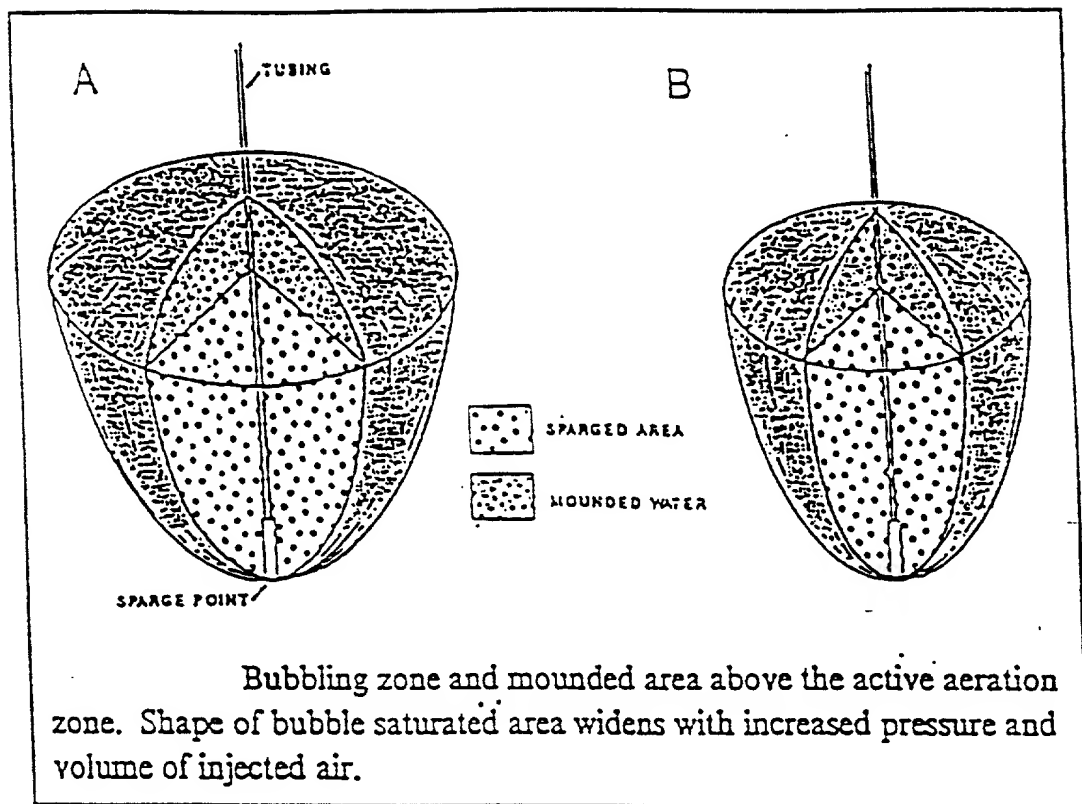
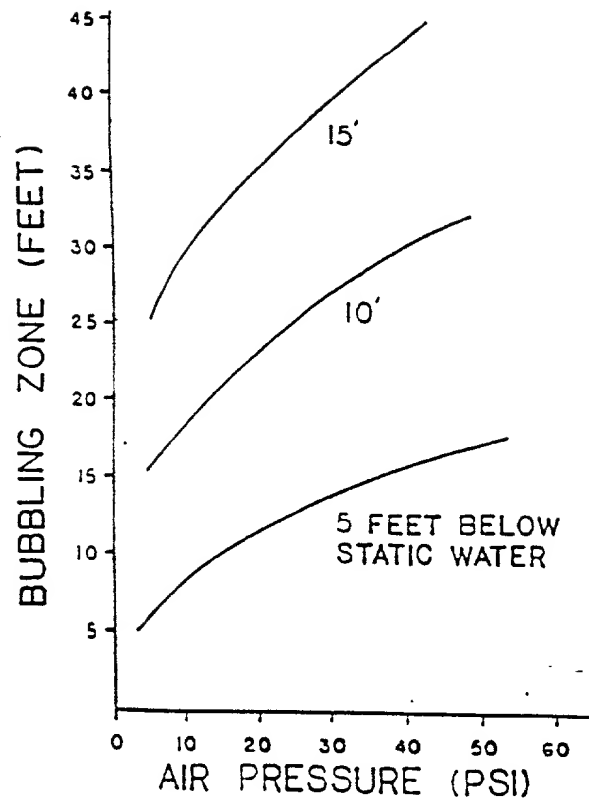


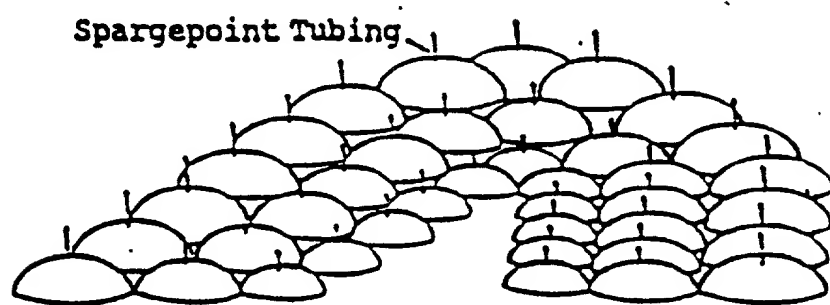
FIG. 19

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**FIG. 20**

Sequential rise in water table from bubbling. Concentric zones permit containing Any floating contaminant.



**FIG. 21**

Sequential rise in water table from bubbling. Concentric zones permit containing any floating contaminant.

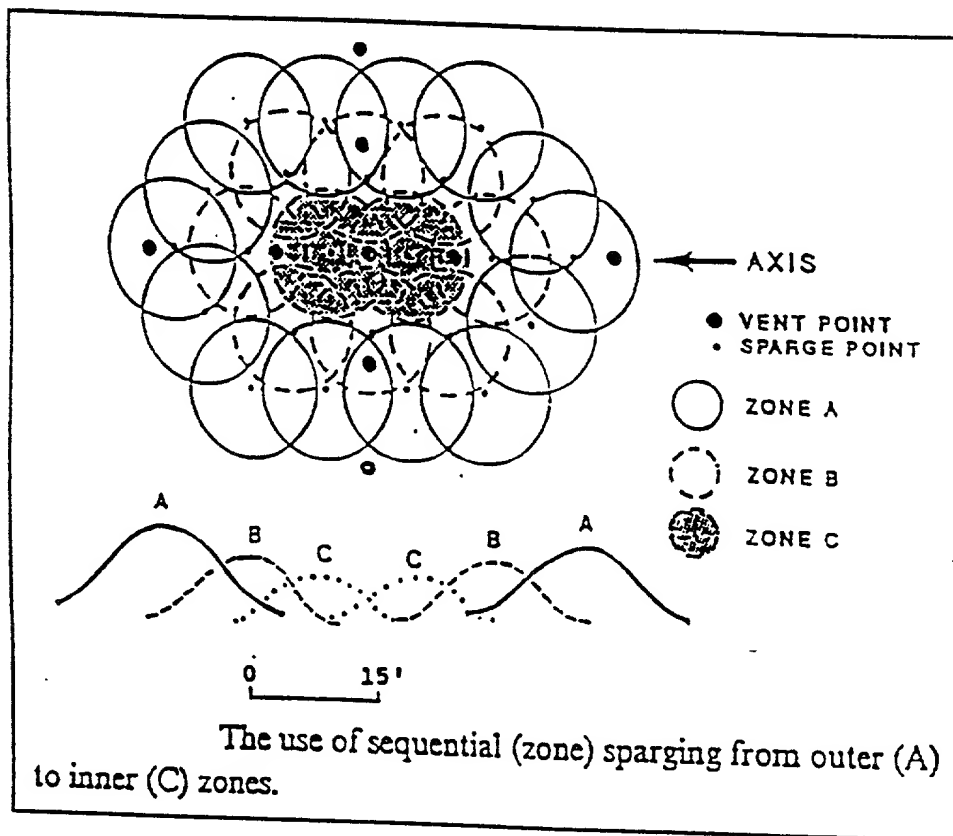


FIG. 22

A schematic diagram of a sparging system. At the top, a rectangular box labeled "SPARGING AIR SUPPLY" is connected by a pipe to a vertical riser pipe. The riser pipe terminates at a "SPARGE POINT" located at the bottom of a well. From this point, two overlapping, teardrop-shaped regions filled with dots represent the "SPARGE ZONE". Above the sparge zone, a dashed horizontal line indicates the water table level. The region between the water table and the ground surface is labeled "VADOSE ZONE". The entire system is shown within a cross-section of the ground, with a stippled pattern representing the subsurface material.

**FIG. 23A**

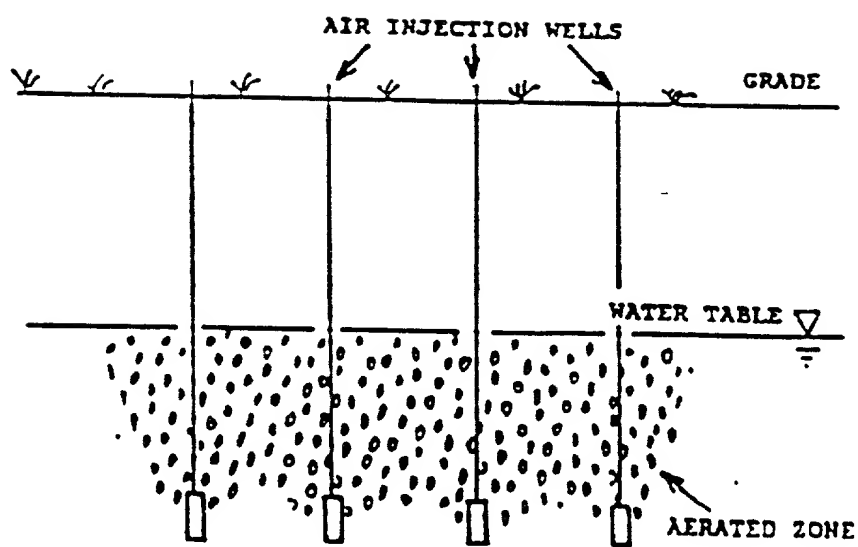


FIG. 23B



A schematic diagram of the weather station components. On the left, a vertical stack of three rectangular boxes is labeled "OUTSIDE WEATHER STATION". Lines connect these boxes to labels on the right: "GAS GENERATOR" for the top box, "COMPRESSOR" for the middle box, and "PUMP CONTROL" for the bottom box. A line from the bottom box connects to a label "air" with an upward arrow.



TOP OF 291660

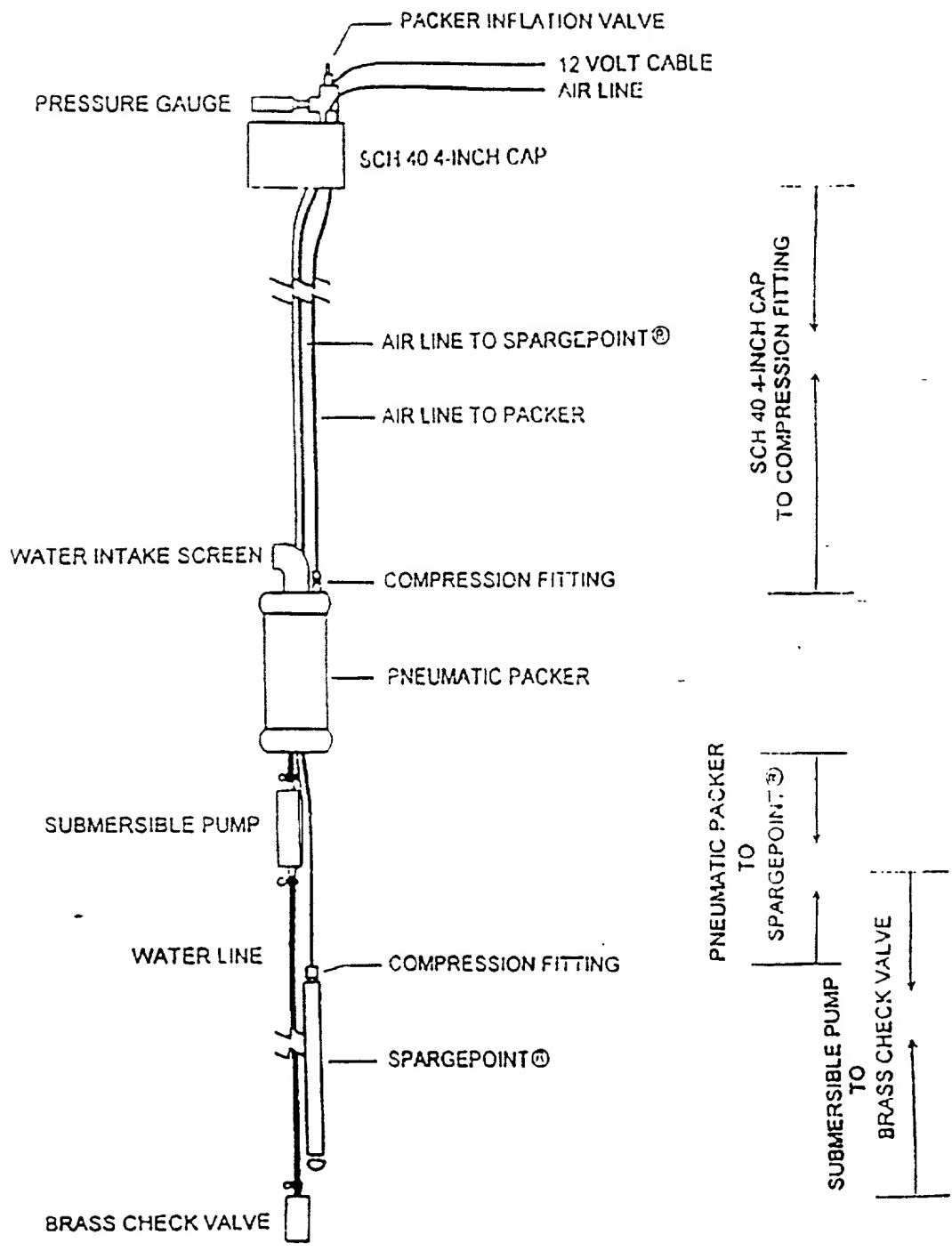
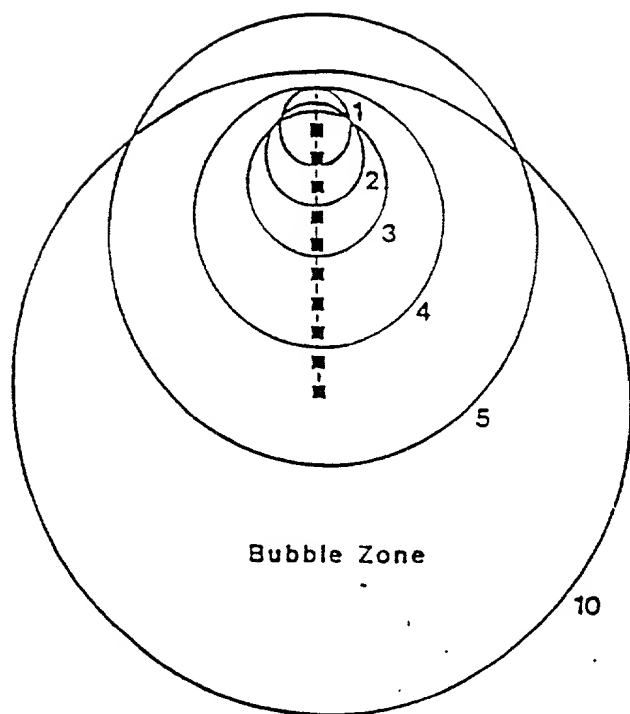
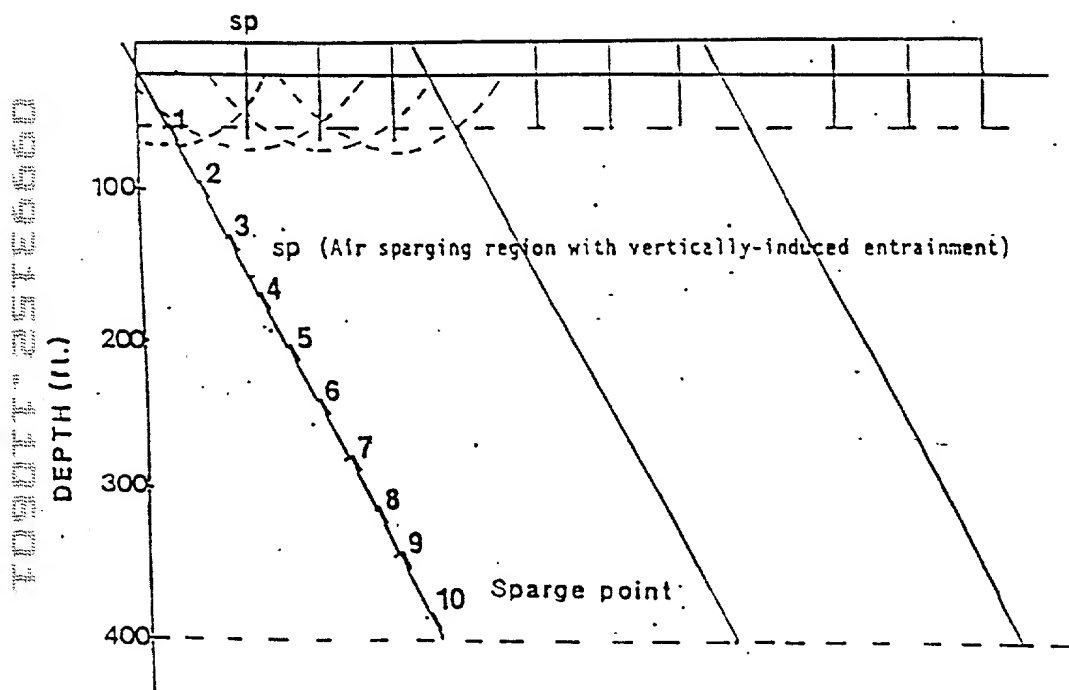


FIG. 25



**FIG. 26**



**FIG. 27**

FOUO 25 FEB 66

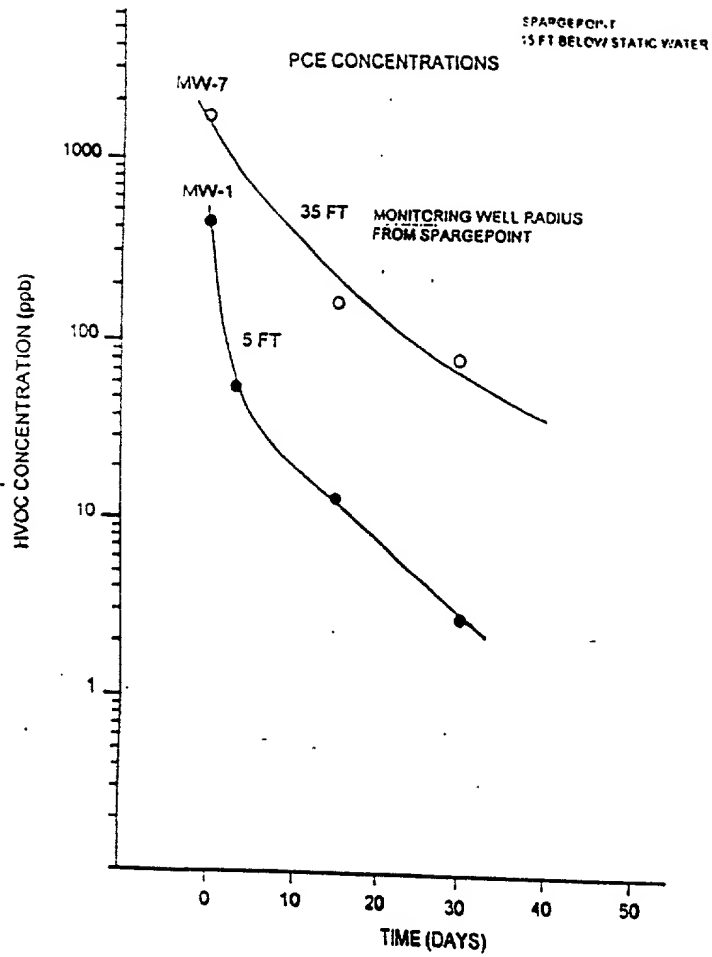
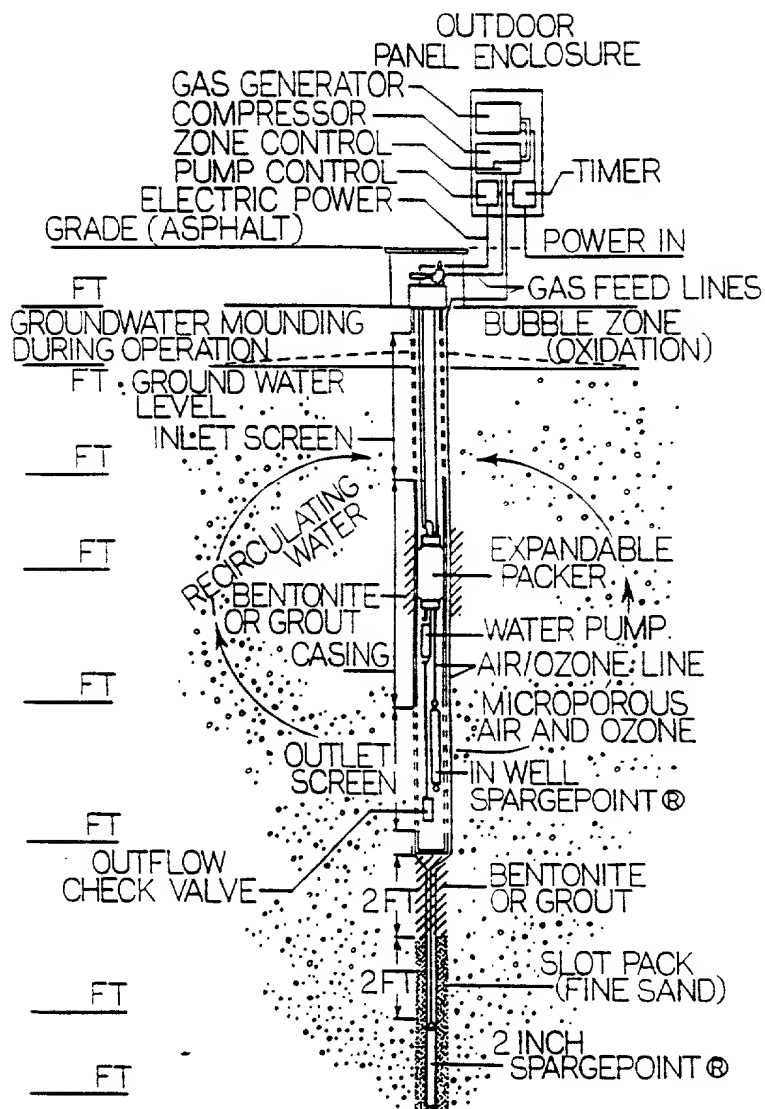


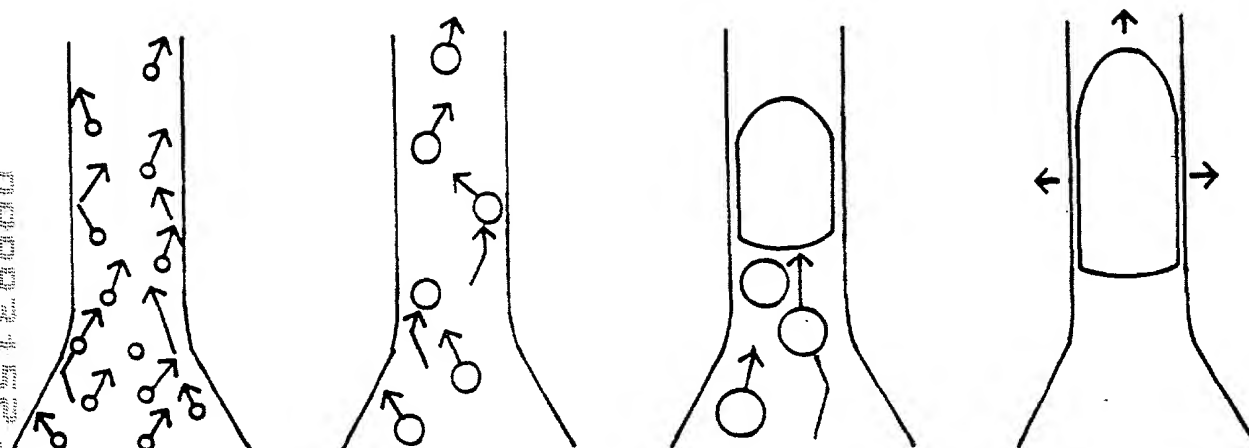
FIG. 28

FIG. 29



**FIG. 29**

00003455.110601



Movement of microbubbles through saturated pores as diameter of bubble increases. showing coalescing.

FIG. 30

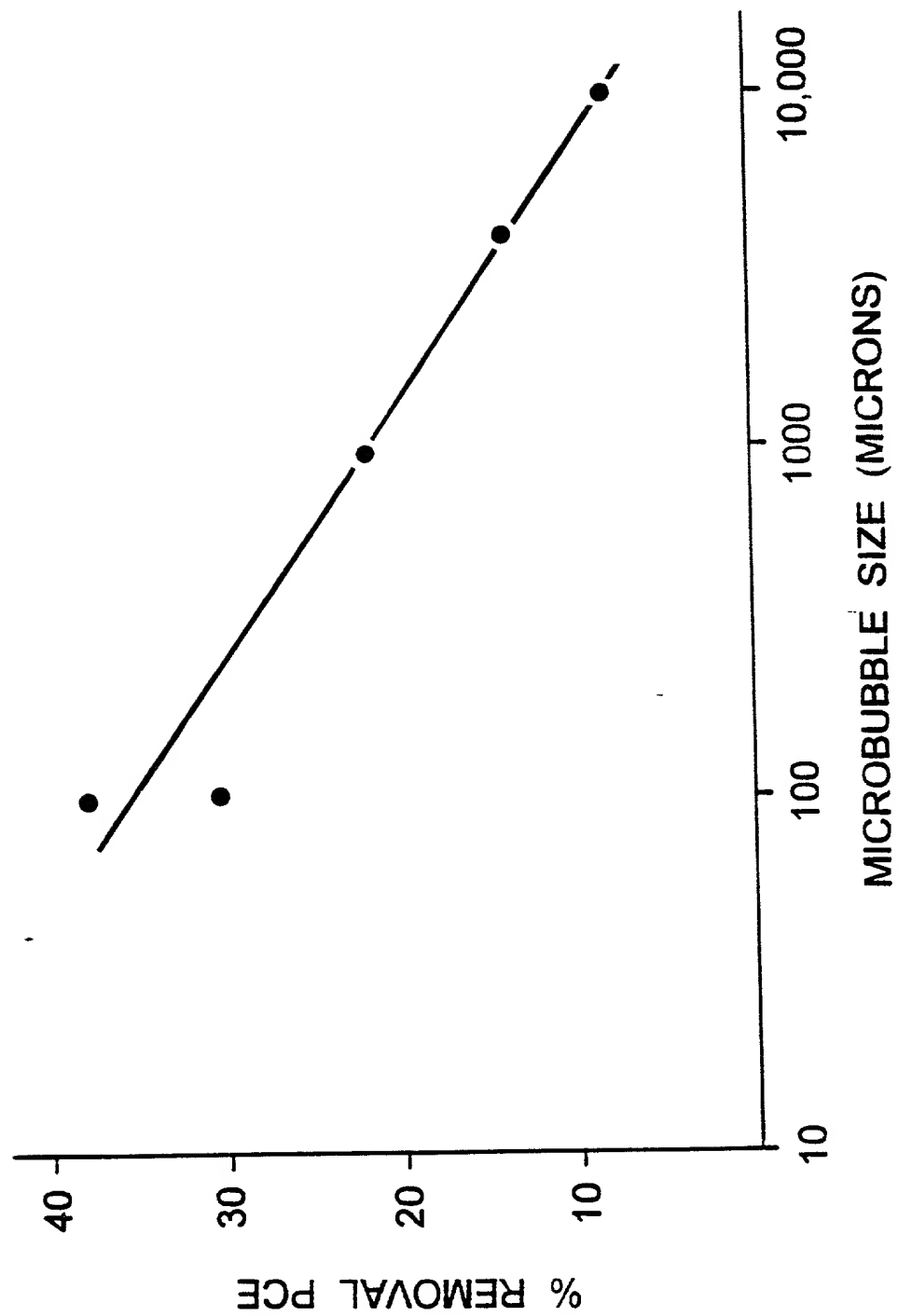


FIG. 31



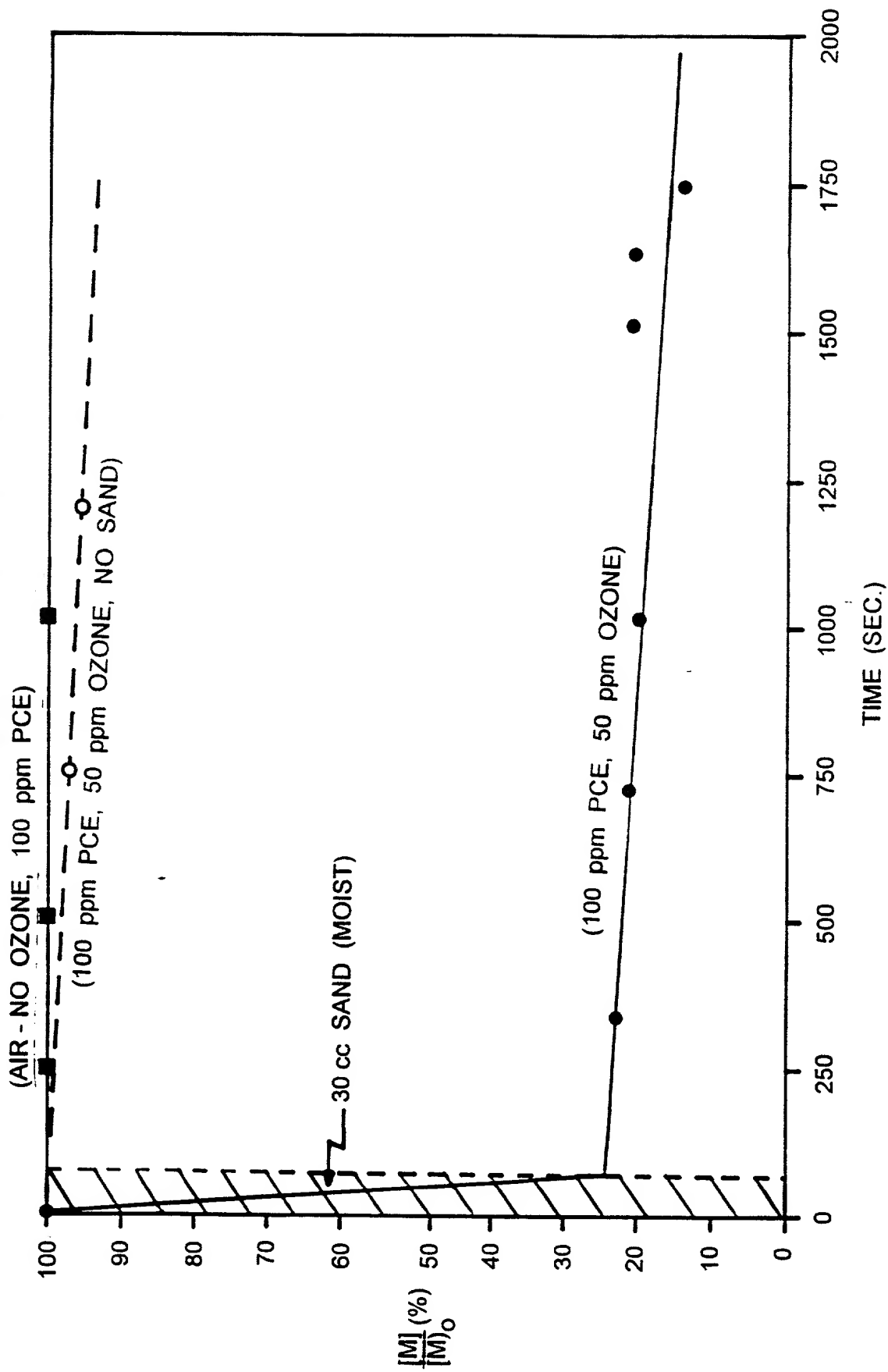


FIG. 32



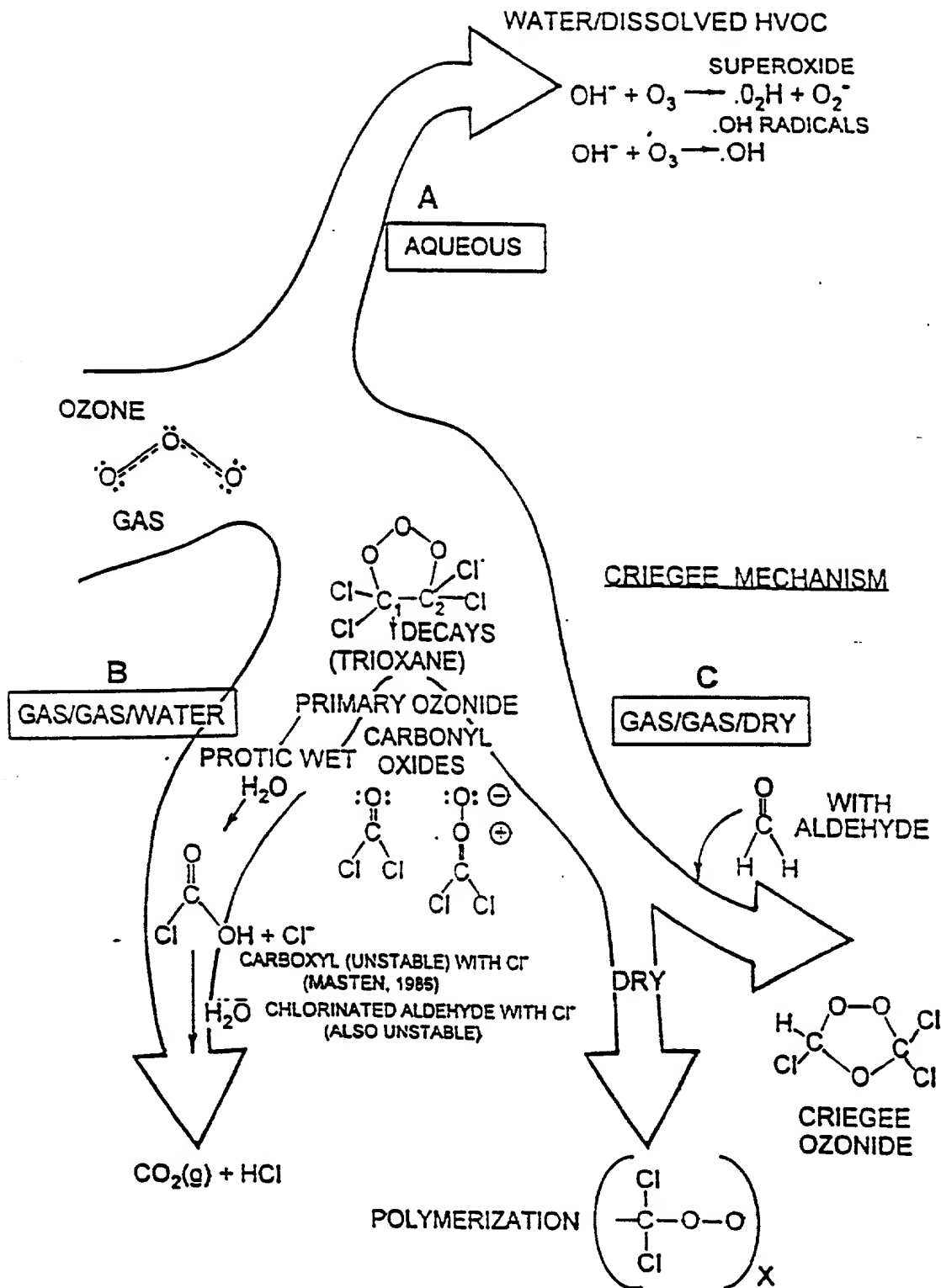


FIG. 34

# MICROBUBBLE GENERATOR COLUMN CHAMBER

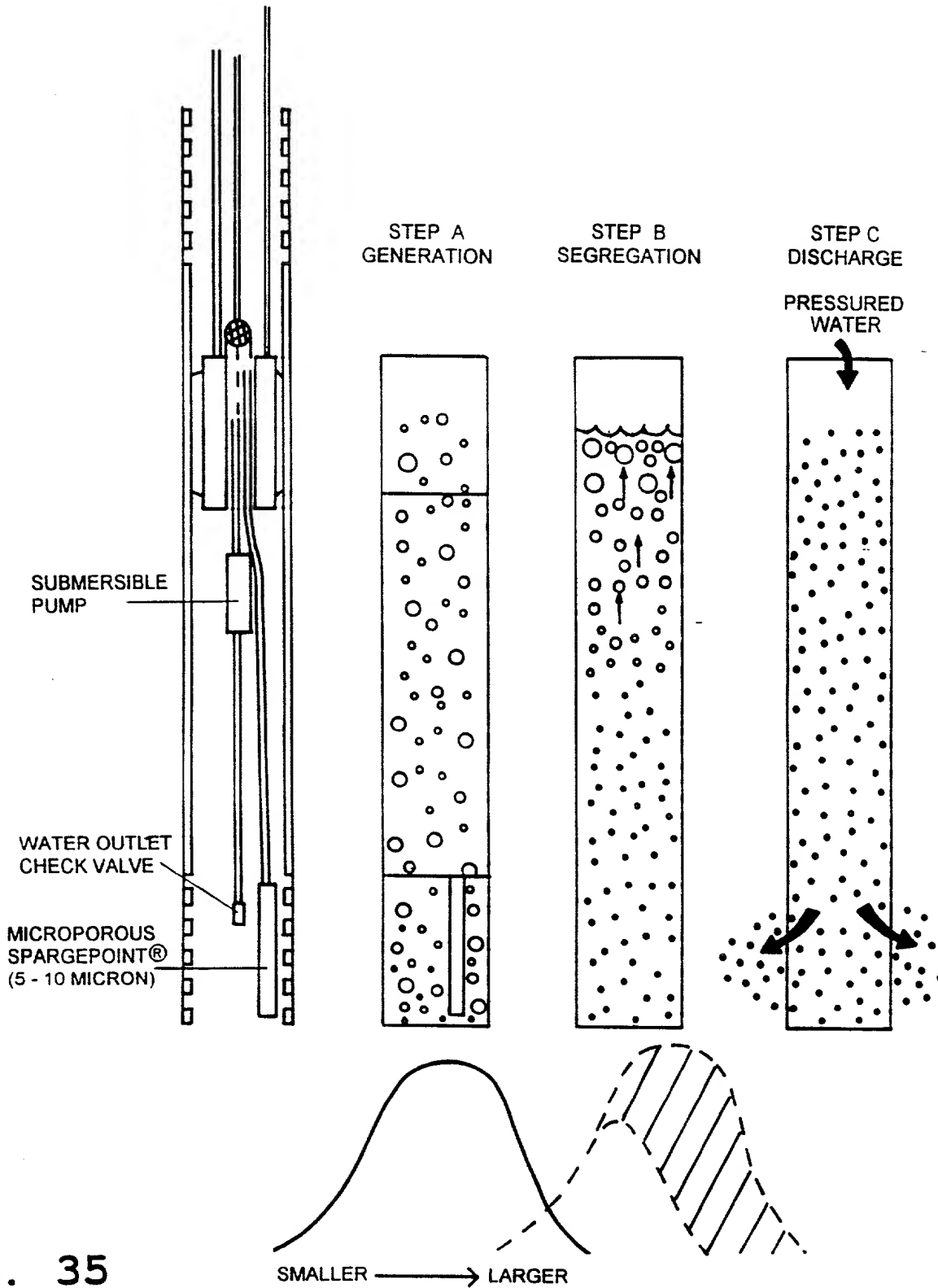


FIG. 35

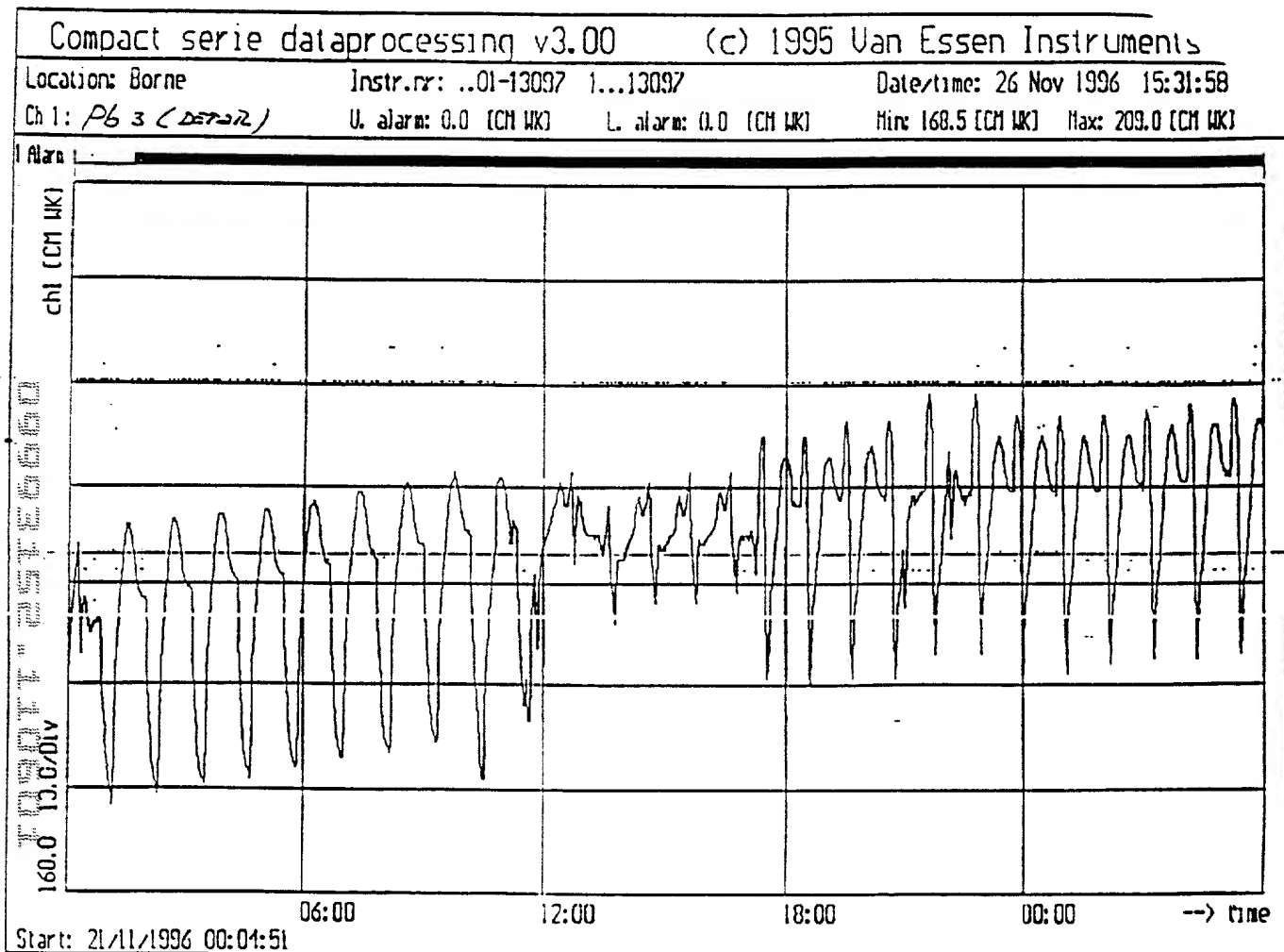


FIG. 36

FOOT " 254660

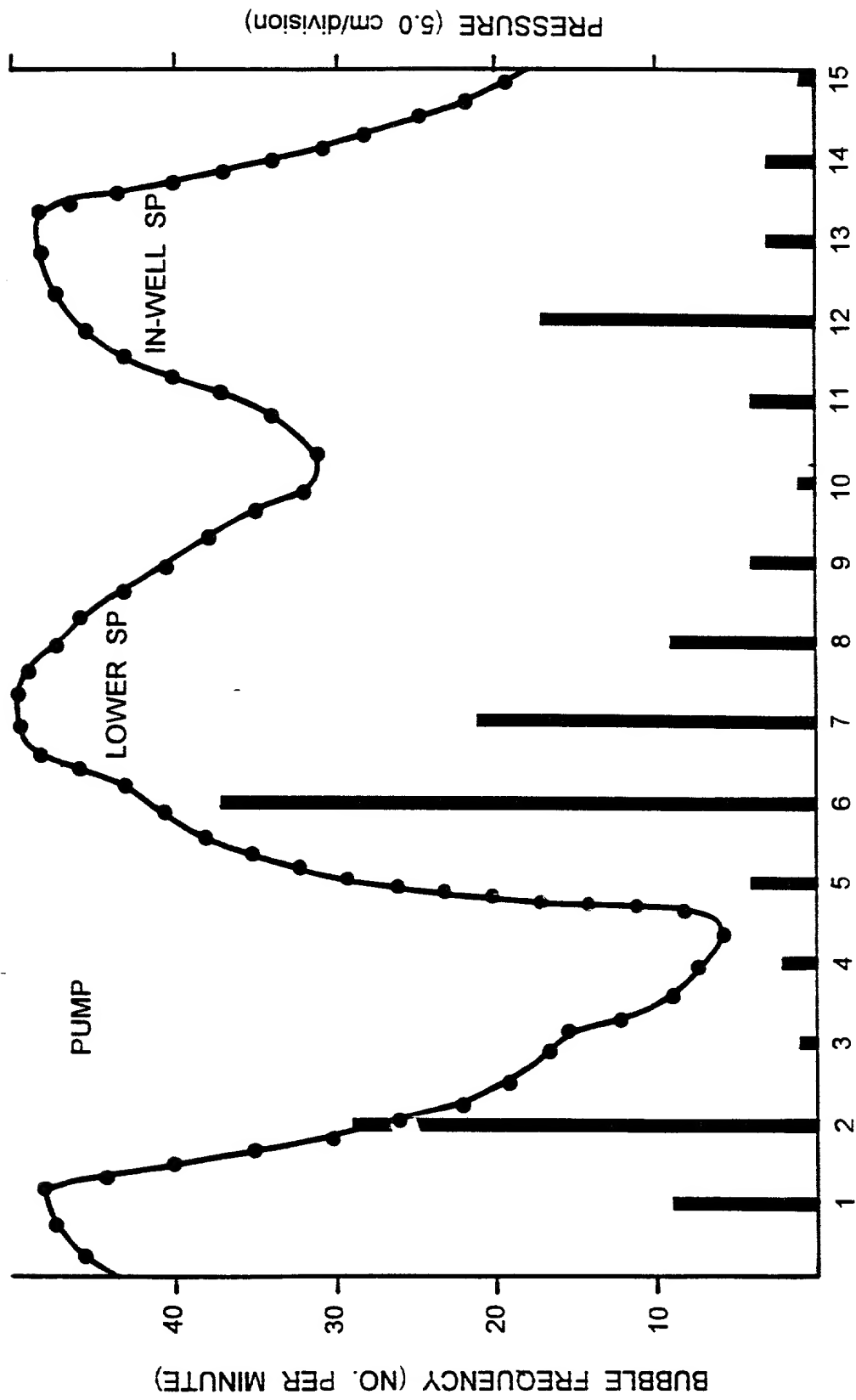


FIG. 37

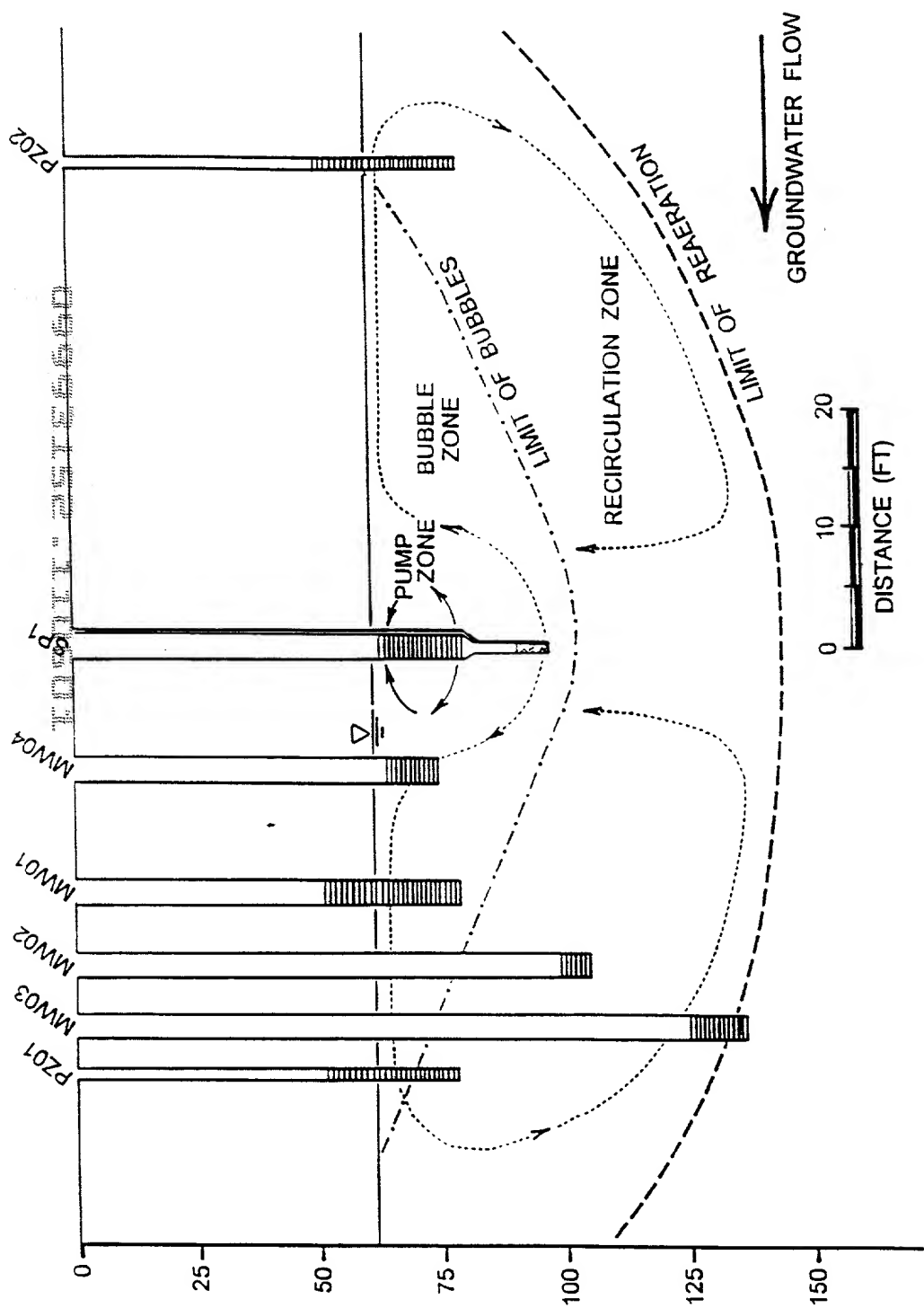


FIG. 38

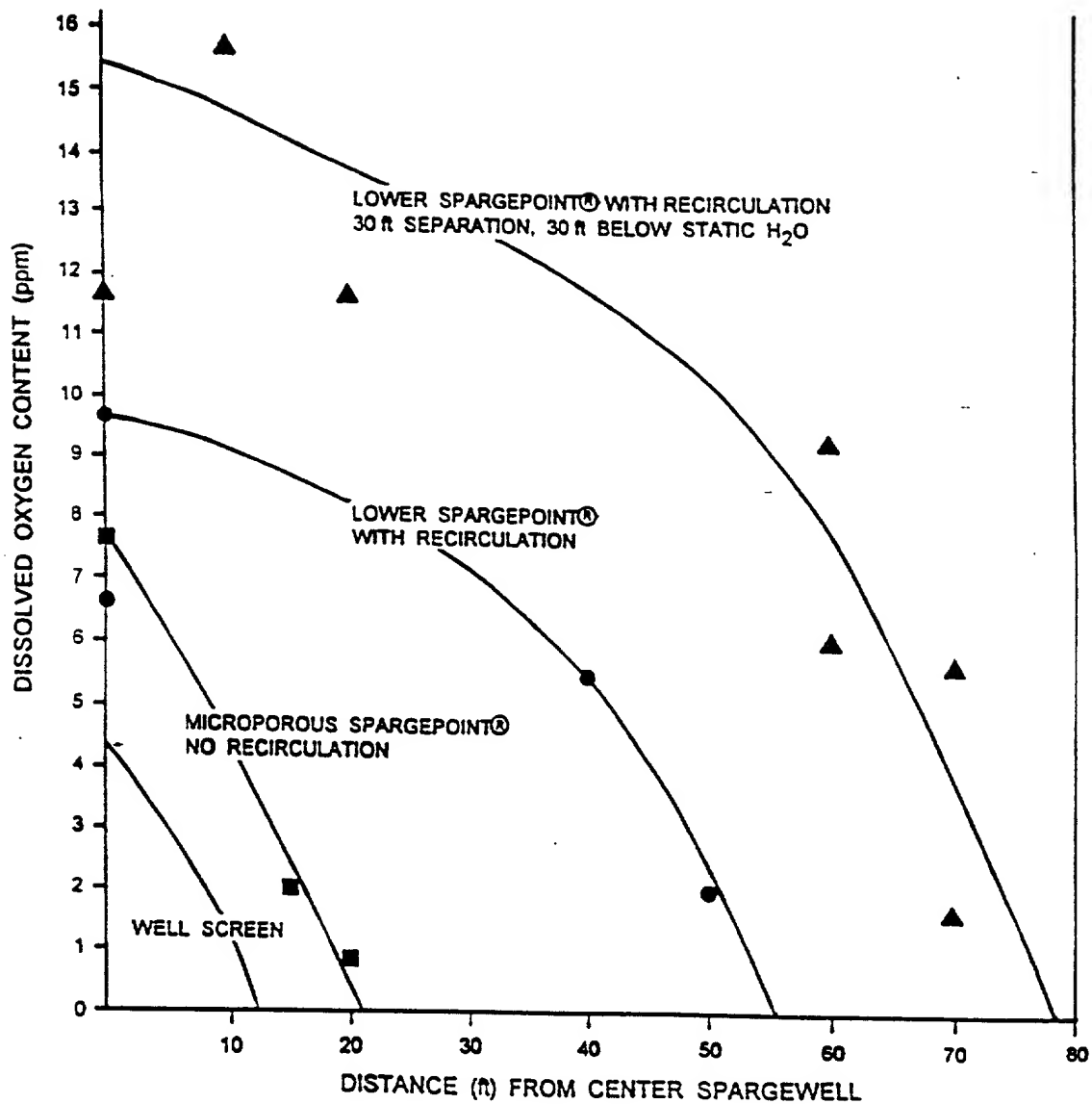


FIG. 39



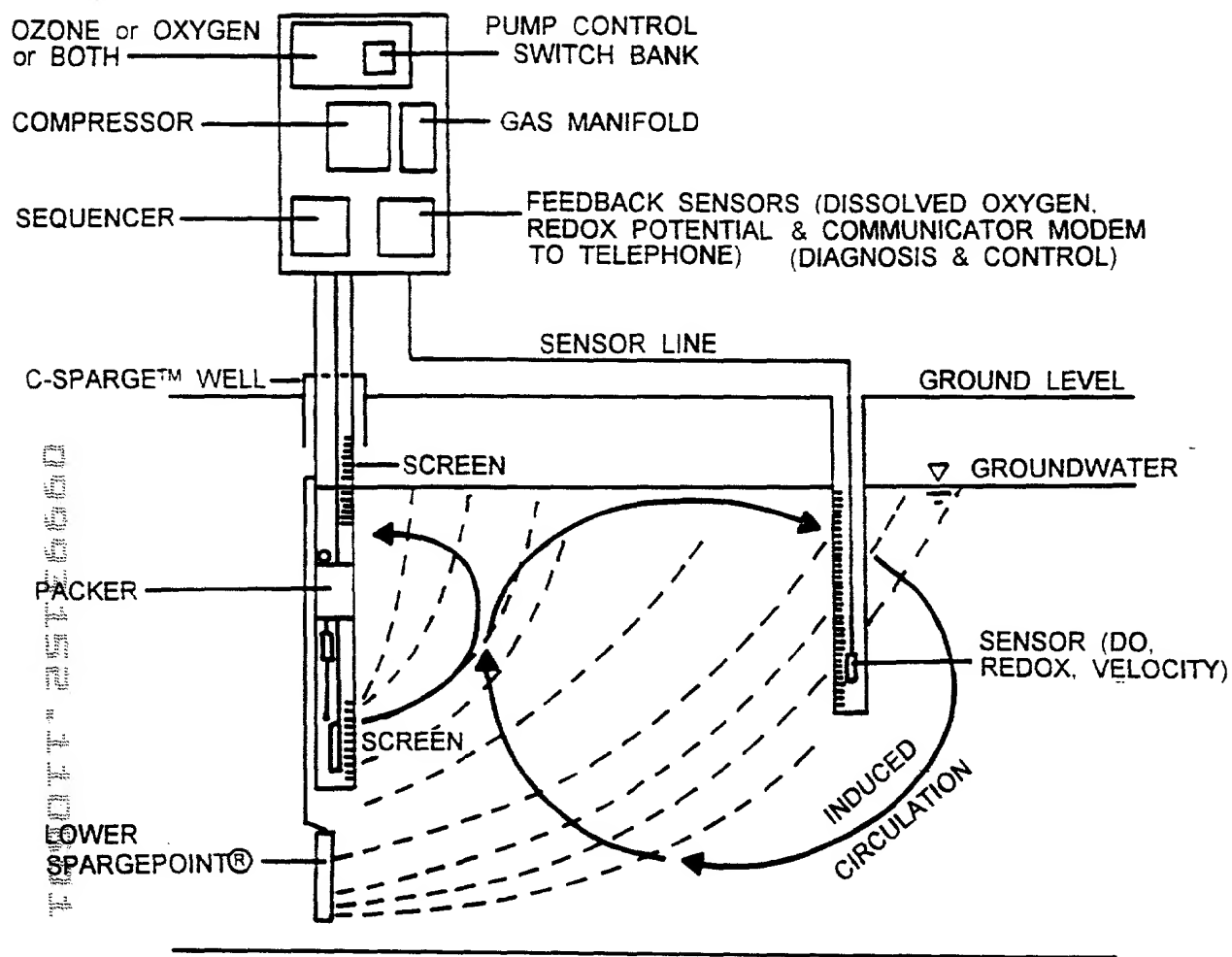


FIG. 40